S-72 Virus Evolution

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Salon Darwin

Baculovirus Adaptation in Varying Environment

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AIMS:

Genetic variation underpins the evolutionary process of adaptation. As populations become adapted to different environments, they diverge from one another. Baculoviruses infecting different host species thus usually belong to different species. Yet some viruses, such as Autographa californica multiple Nucleopolyhedrovirus (AcMNPV), have retained the capacity of infecting many host species. To understand how AcMNPV could draw on standing genetic variation to adapt to different host species we undertook an experimental evolution protocol. A highly polymorphic AcMNPV population was taken through 10 in vivo infection cycles in 4 host species of various susceptibilities, to create 50 evolutionary lines in which the virus was allowed to evolve either as specialist on separate species (4x10 lines) or as generalist on all the hosts (10 lines), whereby the viral population resulted from the infection of all hosts at each generations. We then characterized the genetic make up of the original and evolved baculovirus populations by ultra-deep Illumina sequencing. Using a population genomics approach, we then estimated the global fitness and genetic diversity of each of the evolved populations and their divergence from one another. We found that the specialist lines that evolved on the same host species were more similar to one another than to other lines, especially in the most susceptible hosts, showing experimental evolution could lead to specific adaptation. Furthermore, we found a general diminution of genetic diversity in the specialist lines compared to the ancestral population. The viral lines that could adapt to more resistant host retained higher genomic diversity than those that did not, showing genetic variation is an important component of baculovirus adaptation. Evolution in all the hosts led to high genetic diversity in the generalist lines, which could foster ecological resilience in variable environments such as those encountered by the virus in natural landscapes.